

Why Does Plate Tectonics Occur On Earth But Not On Venus?



Professor Shun-Ichiro Karato

*Department of Geology and Geophysics
Yale University*

Plate tectonics is one mode of mantle convection that occurs when the surface layer (the lithosphere) is relatively weak. When plate tectonics operates on a terrestrial planet, substantial exchange of materials occurs between planetary interior and its surface. This is likely a key in maintaining the habitable environment on a planet. Therefore it is essential to understand under which conditions plate tectonics operates on a terrestrial planet. One of the puzzling observations in this context is the fact that plate tectonics occurs on Earth but not on Venus despite their similar size and composition. Factors such as the difference in water content or in grain-size have been invoked, but these models cannot easily explain the contrasting tectonic styles between Earth and Venus. We propose that strong dynamic weakening in friction is a key factor. Fast unstable fault motion is found in cool Earth, while slow and stable fault motion characterizes hot Venus, leading to substantial dynamic weakening on Earth but not on Venus. Consequently, the tectonic plates are weak on Earth allowing for their subduction, while the strong plates on Venus promote the stagnant lid regime of mantle convection.

9 May 2019



11:30 a.m.



**Conference Room, 3/F,
Mong Man Wai Building**



Enquires: 3943 9624 essc@cuhk.edu.hk